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ABSTRACT OF THE DISCLOSURE

A projection optical system that projects an image on a first side onto a second plane through a plurality of lenses includes: a first lens group that is arranged in an optical path between the first side and the second plane and has a negative refractive power, a second lens group that is arranged in the optical path between the first lens group and the second plane and has a positive refractive power, a third lens group that is arranged in the optical path between the second lens group and the second plane and has a negative refractive power, a fourth lens group that is arranged in the optical path between the third lens group and the second plane and has an aperture stop in the optical path, and a fifth lens group that is arranged in the optical path between the fourth lens group and the second plane and has a positive refractive power. An clear aperture of a lens surface or an outer diameter of a lens of the plurality of lenses in the projection optical system as a relative maximum in the second lens group, a relative minimum in the third lens group, and a relative maximum in the third-fifth lens groups, and has only once significant minimum between the first side and the second plane. At least one of the plurality of lenses is held such that at least one of a position and an orientation of the lens is

adjustable, and a numerical aperture of the second plane of the projection optical system is equal to or more than 0.8.

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